Indigenous Technology Knowledge: Survey, Analysis, and Electronic Data Base Creation of Local Herbal Wealth of the Shivalik Hills of the Western Himalayas, India

SYNOPSIS

Submitted in Partial Fulfilment of the Requirements for the Award of the Degree
Of

DOCTOR OF PHILOSOPHY

in

BOTANY

Submitted By

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Introduction

Approximately after 3.5 billion years of evolution, we are here today. There is a prediction by the scientists of the world that there are many more species yet to be discovered on the earth. Due to the various side effects of the allopathic drugs, the demand of medicinal plants is growing continuously and market potential of these herbal drugs is very high. Medicinal plants are the important health and economic components of developed and developing countries. The worldwide interest in traditional medicines and developing new drugs and pharmaceuticals has been considerably increased. Medicinal plants have been in use all over the world to treat various diseases including infections, cancer, inflammation, heart diseases etc. There are literally millions of plants, combinations, traditions and household remedies to treat variety of diseases and to boost health (Pearce, 1994).

The use of natural products for treatment of all kinds of diseases is due to their less harmful effects as compared to drugs synthesized in laboratory. In all the areas of the world, locally used herbal treatments are common and have been under investigation to get active principle of these remedies. Ethnobotanical information leads to the discovery of novel plant based pharmaceutical products. Aboriginal people had tested most of the plants and became surprised by noticing its magical power to cure various ailments. Later when man got civilized the use of traditional knowledge about the plants is advanced in a drastic way. Now researchers all over the world gave more attention to study indigenous knowledge for the welfare of mankind. Field work in tribal areas with ethnic people and analysis of tribal folklore has yielded enormous information. The written records about medicinal plants dates back at least 5,000 years to the Sumerians, archaeological studies have shown that the practice of herbal medicine dates as far back as 60,000 years ago in Iraq and 8,000 years ago in China by Pan *et al.*, (2014). India has had a history of ancient traditional medicinal practice based mostly on Ayurveda, Siddha and Unani system of medicine. Human civilization has always produced, developed and delivered knowledge from generation to generation. Such “traditional” knowledge” has always been an important part of the cultural identities of mankind. As the time passes and with the evolution process, appreciation of the value of traditional knowledge is constantly growing. This knowledge is treasured not only for those who depend on it in their routine lives, but also to modern industry and agriculture. Nowadays many commonly used products, like herbal or plant-based medicines, well-being products and makeups or cosmetics, are derived from

traditional knowledge worldwide. Traditional knowledge is the knowledge possessed by the indigenous people or the ethnic groups or communities around the world. The knowledge has developed through long term experience and often tested over long period of use and validated to meet their immediate need.

Traditional knowledge is a broader category that includes indigenous knowledge as a type of traditional knowledge held by indigenous communities (Mugabe 1998). Traditional health care system is facing serious challenges due to lack of knowledge of medicinal plants regarding its use and preparation or formulation because the local healers do not pass on their knowledge to other members of community as they fear that it could be misused. Healers did not want to disclose their knowledge regarding the methods of drug preparation from plants as they also believe that disclosure reduces the effect of the drugs. The unwritten knowledge/wisdom continually used and developed by generations, coming out of experience through tradition, heritage, culture or family or social setup is called traditional knowledge. Traditional knowledge is constantly playing a very important role in the daily lives of the majority of people across the globe. Traditional knowledge is essential to the food security and health of millions of people in the developing world. In many countries, traditional medicines provide the only affordable treatment available to poor people. The use of herbal medicines and phytonutrients or nutraceuticals continues to expand rapidly across the world with many people now resorting to these products for treatment of various health challenges in different national healthcare settings (WHO, 2004).

Traditional Knowledge is now growingly recognized in developing as well as developed countries due to its important role played in economic, social, and cultural development since time immemorial, and as a result of increasing awareness of the value of biodiversity, environmental crisis and sustainable development. India has great traditional knowledge about the uses of medicinal plants that are still valued. Traditional knowledge on the medicine means the use of the plants available in the surroundings for the treatment of ailments. Each community has its own set of information and this knowledge on medicinal plants is not documented. The collection of data and documentation of such hidden information is new to science and it will help in the sustainable use of such medicinal plants.

Himachal Pradesh, a hill state has rich plant diversity of variety of medicinal plants and large percentages of crude drugs are manufactured from the raw materials that come from

this region. There are about 3500 known plant species recorded in the state, about 500 are reported on medicinal value (Chauhan, 2003). Still many more are unexplored; it is a suitable area for the study of traditional knowledge about the medicinal plants of local people.Shivalik hills range is the outer Himalayas in the western Himalayas. The altitude of Shivalik Range varies from 350 meters (1050 feet) to 1500 meters (4500 feet) above mean sea level. This range of outer (lower) Himalayas is well known as 'Shivalik Hills' (also known as Manak Parbat in ancient times). Shivalik literally means 'tresses of the Shiva'. It covers the lower hills of district Kangra, Hamirpur, Una, Bilaspur and lower parts of Mandi, Solan and Sirmaur districts. The famous places in this zone are Paonta valley, Nahan tehsil, Pachhad and Renuka tehsils of Sirmaur districts, Balh valley and Jogindernagar area of Mandi district, Kangra, Dharamshala, Palampur and Dehra of district Kangra, Dalhousie, Bhattiyat, Churah and Chamba tehsil of Chamba district. The annual rainfall in this zone varies from 1500 mm to 1800 mm. (Website: Himachal World, 2005).

Maps of the Proposed Shivalik Range

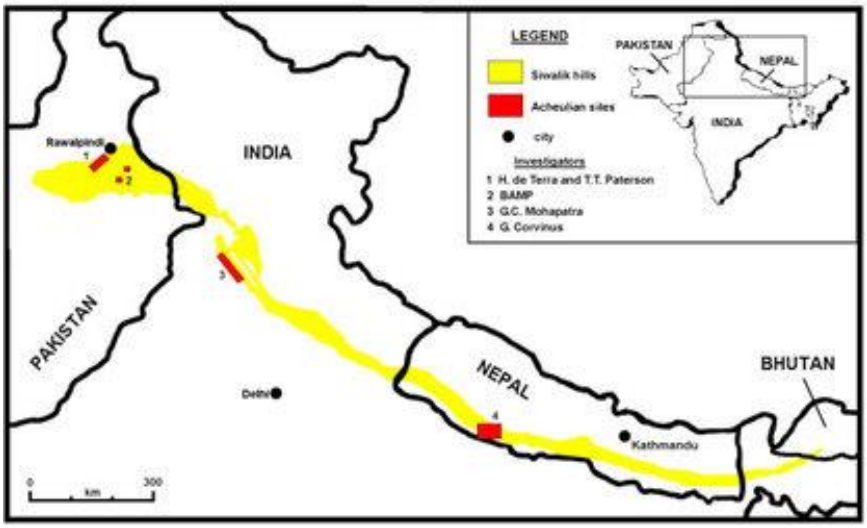

Fig.1 Map showing location of the Shivalik range.

(Source: Research Gate; Link : https://www.researchgate.net/figure/Map-showing-location-of-the-Shivalik-range_fig1_317168718).

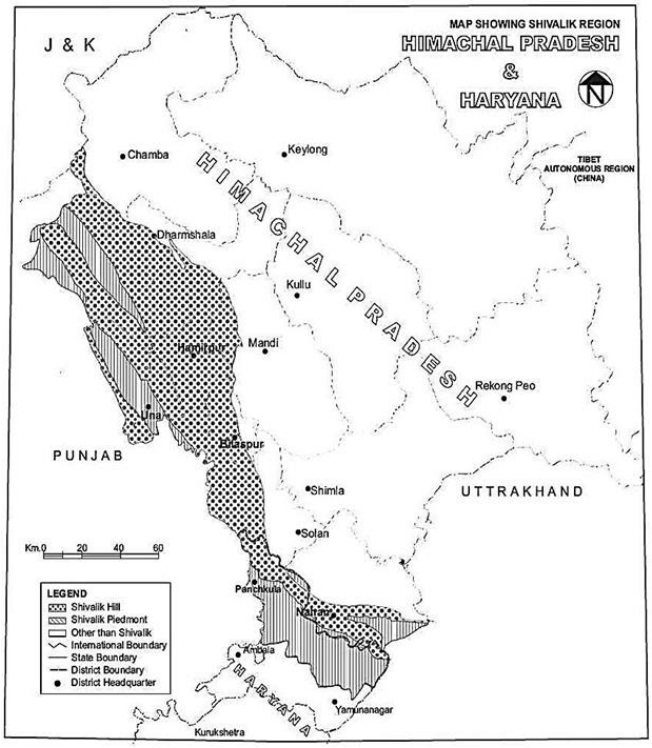

Fig. : 2. Map of Shivalik region in Himachal Pradesh and Haryana.

(Source: Research Gate); Link : https://www.researchgate.net/figure/Map-of-Shivalik-region-in-Himachal-Pradesh-and-Haryana_fig2_281741717

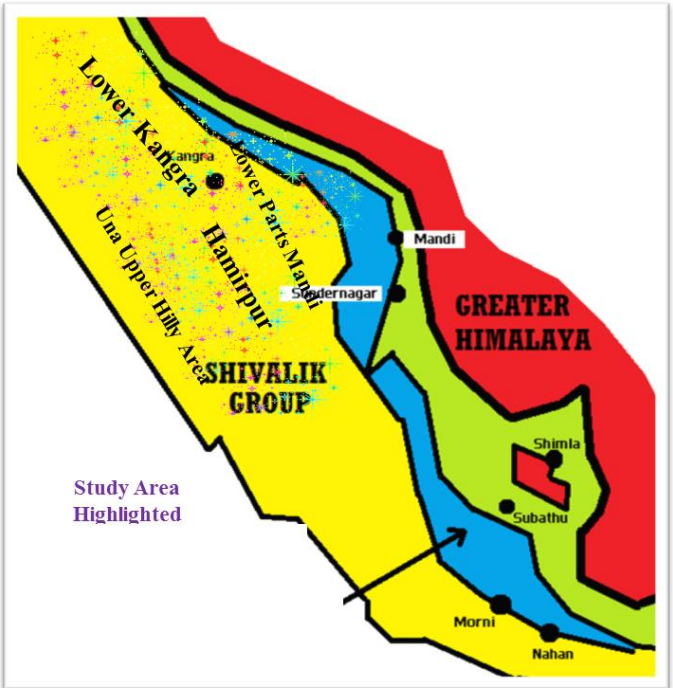

Fig. : 3. Shivalik Range in Western Himalayas

(Source: https://www.hillsofmorni.com/morni-hills/geology-of-morni-hills)

Proposed Study Area

Fifteen seven (57) villages from nineteen development blocks from five districts of the Shivalik Hills range have been selected for proposed study. They are as follows:

1. **District Hamirpur :** Eighteen villages from six blocks have been selected and they are as follows :

i. **Hamirpur** : Badhar, Dhangu, Kuthera
ii. **Nadaun** : Rangas, Dhaneta, Niati
iii. **Bijhari** : Garli, Bijhari, Narghol
iv. **Bhoranj :** Badhani, Mundkhar, Sahnwin
v. **Sujanpur** : Kot, Tira, Daruhi
vi. **Bamson** : Barara, Gulela, Pandher

2. **District Una :** Fifteen villages from five blocks have been selected and they are :

i. **Amb:** Saloi, Rakkar, Lohara
ii. **Bangana** : Govind Sagar Lake, Bangana, Saloh
iii. **Gagret** : Baroh, Gagret, Kaloh,
iv. **Haroli** : Goindpur, Kungrot, **Pubowal**.
v. **Una** : Basal , Daultpur, Kuthar Kalan.

3. **District Bilaspur :** Eighteen villages from six blocks have been selected and they are as follows :

i. **Bharari :** Bam, Dangar, Pantera
ii. **Bilaspur Sadar :** Chandpur, Kandror, Ropa
iii. **Ghumarwin :** Baldwara, Bhager, Loharwin
iv. **Jhanduta :** Barthin, Kalol, Ser
v. **Nanina Devi :** Ajnol, Badoh, Mehla
vi. **Namhol :** Kothi, Namhol, Nalwar

4. **Distrcit Kangra :** Three villages from one block have been selected and they are : **Dehra**: Pragpur, Masrur, Gopipur.
5. **District : Mandi :** Three villages from one block have been selected and they are : **Gopalpur :** Jawali, Hawani, Baldwara

REVIEW OF LITERATURE

Exploring in depth knowledge and understanding on prevailing use of therapeutic herbal wealth found in lower and middle Shivalik region of North Western Himalayas is the need of time and humans besides animal life for sustenance and wellness of every living being. Very few books, journals, articles, websites have been written, the prominent among them were: The book “Economic studies of Indigenous and Traditional knowledge" edited by" Sengupta (2007) deals with traditional and indigenous knowledge of common men and women of India. Different chapters, by different authors show the significance of traditional knowledge in different areas like forest farming, animal and husbandry, distortions in the relationship between man and nature and building the bridge between them, fisheries product and distribution, housing, irrigation, economy of homestead garden, medicinal knowledge, and drinking water collection.

The history of Indian medicine is very old. Since very early days, the knowledge of ethno medicine has been passed on from generation to generation among the tribals and it survived in certain restricted aboriginal habitations. Ethnobotany may be defined as an anthropocentric approach to botany, concerned with gathering of information on plants and their uses. The term “Ethnobotany” was first coined by Harshberger in 1896. Cotton (1996) reviewed the area which encompasses all the studies concerning with the mutual relationship between plants and traditional people.

Ethnobotany is not a new field of research to Indian sub-continent besides China. However, acceptance of its importance using modern science is new where new age scientists are investigable using modern tools and concert the usefulness of ethnobotany to different life forms industry. Harshberger to the present date, several authors have tried to give a description of subject ethnobotany and its scope, methodology and its various disciplines, sub-disciplines and potential etc**.** Uniyal and Chauhan (1982) studied commercially important medicinal plants of the Kullu forest division in Himachal Pradesh. Jain (1986) gave an overview of the subject ethnobotany and indication of the significant research during last thirty years in this field and also showed how ethnobotany is an interdisciplinary science. The important fields like food and nutrition, defence and survival, society and culture, religion, medicine, art and literature, mythology, anthropology, archaeology, forestry, and agriculture, economics, language, history and politics and conservation etc. are the major fields linked to the research.

Singh and Kumar (2000) studied the ethnobotanical wisdom of gaddi tribe in the western Himalayas (Himachal Pradesh). Sharma *et al*. (2003) gave an account on the commercial importance of medicinal and aromatic plants of Parvati Valley, Himachal Pradesh. Thakur *et al.* (2004) described the characterization of some traditional fermented food and beverages of Himachal Pradesh. Warman (2004) studied the medicinal commercial religions and ornamental properties of various trees of India in "Trees of India". Kala (2005) described on the ethno-medicinal botany of the Atapani in the Eastern Himalayan Region of India. Lal and Singh (2008) found out the indigenous herbal remedies to cure skin disorders by natives of Lahaul Spiti, Himachal Pradesh. Prakash and Aggarwal (2010) highlighted the traditional uses of medicinal plants of lower foot-hills of Himachal Pradesh. Sharma *et al.* (2010) described about anti-diabetic potential of alkaloid rich fraction from *Capparis decidua* on diabetic mice. Kaur *et al.* (2011) studied the uses of plants in control of different diseases in Mandi district, Himachal Pradesh. Choyal (2012a) gave an account on the ethno botanical notes on some plants of Hamirpur district of Himachal Pradesh used in the treatment of Arthritis, rheumatism and other inflammatory disorders. Kumar and Choyal (2012b) investigated traditional phytotherapy for snake bites used by the rural people of Hamirpur district of Himachal Pradesh, India. Kumar and Kumar and Choyal (2012c) reported the traditional uses of some plants of Hamirpur district of Himachal Pradesh for the treatment of Jaundice, Hepatitis and other liver disorder. Kumar and Choyal (2012d) gave an account on ethnobotanical notes on some plants used for the treatment of leucorrhoea and other gynaecological problems in Hamirpur district of Himachal Pradesh. Kumar *et al.* (2013) worked on the ethnobotanical survey of medicinal plants used for the treatment of different diseases in Bikaner district of Rajasthan.

Jain (1965) outlined the prospects by some new or less known medicinal plants resources. Uniyal and Chauhan (1982) studied commercially important medicinal plants of the Kullu forest division in H.P. Jain (1986) gave an overview of the subject ethnobotany, and indication of the significant research during last thirty years in this field and also showed how ethnobotany is an interdisciplinary science. Chauhan (1999) studied medicinal and aromatic plants of Himachal Pradesh. Badola and Aitken (2003) gave an account on the Himalayas of India: A treasury of medicinal plants under siege. Ayyanar and Ignacimuthu (2005) studied medicinal plants used by the tribals to treat poisonous bites and skin diseases. Krishnaveni, M. (2012) reported medicinal plants – a boon for HIV / AIDS.

Traditional and indigenous uses of medicinal plants by local residents in Himachal Pradesh by Vidyarthi *et al.* (2013). Pooja *et al.* (2014) gave a review on ayurvedic medicinal plants for eye disorders. Narayana and Narasimharao (2015) studied Plants used in ethno veterinary medicine by tribals. Akena (2016) highlighted traditional knowledge in HIV/AIDS treatment and prevention programme in northern Uganda. Indigenous knowledge of medicinal plants used by tribals and rural people of South Kashmir Himalayas by Khanday and Singh (2017). Thakur and Sidhu (2017) gave medicinal plant remedies for dermatological problems. Moradi *et al.* (2018) recorded the most useful medicinal herbs to treat diabetes. Singh (2018) described ethno medicinal plants used by traditional healers. Sundaram *et al.* (2019) worked on indigenous knowledge on medicinal plants used to treat haemorrhoids. Natural Foods and Indian herbs of cardiovascular interest were recorded by Mohiuddin (2019). Kumar and Chander (2019) studied traditional usage of ethno-medicinal plants of Sikandra Hill range in Mandi. Mayers *et al., (*2000) described Indian Himalayan region (IHR) is one amongst the thirty-eight biodiversity hotspots of World. However, in Himachal Pradesh, such studies are incomplete and mainly focused on inventory (Bhattacharya and Uniyal, 1982; Badola and Pal 2003; Samant and Pant, 2006). Some workers have mentioned medicinal uses of plants in ethnobotanical notes, floristics and biodiversity studies (Choudhary and Wadhwa, 1984; Aswal and Mehrotra, 1994; Sharma and Singh, 1996; Sharma and Dhaliwal, 1997; Singh and Rawat, 2001; Kaur and Sharma, 2004; Samant *et al.*, 2007; Samant *et al.*, 2011; Sharma and Kumar, 2015; Kumar and Chander, 2018; Chander *et al.*, 2018). Marpa *et al.* (2020) studied the diversity and indigenous uses of plants in Naina Devi Sacred Shrine Rewalsar, Himachal Pradesh, North Western Himalaya.

From the review of literature it has been observed by the researcher that though there is vast literature available on the traditional agricultural and herbal medicinal areas in India, but still there is a huge shortage of literature in the field of grass root traditional knowledge. They are yet to be documented. As a matter of fact, traditional knowledge is available, in two different types. The systematic documented traditional practice is in a better position but the undocumented, unorganized, passed orally, culturally are being depleted with the passage of every second along with a death of an old knowledgeable traditional rural person. It is high time to document this traditional knowledge in the Shivalik range. The present study is therefore, an effort to explore the traditional knowledge and practices in the proposed study area.

OBJECTIVES

i. Survey, occurrence, therapeutic uses, and practices of different herbal plants in the Shivalik Hills range.

ii. Assess the market potential and conservation needs of the available targeted herbal species.

iii. Create an electronic database from a national and international perspective with the help of information and communication technology.

Methodology and Work Plan

Survey and Field Exploration:

The present research work will be based on survey approach and it will be carried out in the randomly selected villages from the different development blocks of the study area districts which are situated in the Shivalik Hills of Western Himalayas of Himachal Pradesh. Although these sites will be given main emphasis while collecting the plants, attempt will also be made to cover almost all the areas of the sites so as to provide a proper documentation of all the plant species. The plant specimens will be collected during flowering and fruiting season and photographs of the plants will be taken in their natural habitat as well as in kitchen gardens and in the traditional healers' places.

Requirement for the collection of plants:

The following collecting tools & items will be used during the survey works:
1. Hand clippers, stapler and knife, 2. Polybags of different sizes and hand gloves, 3. Field note-book, 6. Digital camera, 7. Old newspaper, 8. Marker, pen, pencil and eraser, 9. First aid kit.

Methods of plant collection and preparation of herbarium specimens:

Plant specimens will be collected during the surveys and processed in the herbarium laboratory based on the methodology laid down by Jain and Rao (1978). Hand clippers will be used while collecting the plant to minimize damage to the collected specimen. Plants will be pressed immediately after collecting in the field. Plants specimens will be treated with 10% formaldehyde or mercuric chloride solution (0.5%) to protect against insect and fungal attack before mounting on the herbarium sheets and stored carefully. Plant will be pressed by placing the specimen inside one of the single sheets of folded newspaper, all of which are temporarily stacked one upon another. The poisoned, pressed and dried specimens will be mounted on standard herbarium sheets size (42 by 28) cm with a herbarium label (8 by 12) cm which is pasted below on the corner of every sheet by using glue. Naphthalene balls and periodical fumigation with formaldehyde shall be used as repellent for keeping herbarium sheets in Herbarium Elmira's.

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Identification of plant specimens:

Identification of plant is done by considering the morphological characters and reproductive features of the plant specimens. Collected plant specimens will be identified with the help of "Flora of British India" (Hooker 1872-1897) available at Botanical Survey of India, Dehradun, Institute of Himalayan Resources Technology, Palampur and CPU – Hamirpur Herbarium. Plants will be preserved in the form of herbarium. The specimens will be deposited in CPUH (The herbarium, Department of Bio-Sciences, Career Point University).

Questionnaire Method and Interviews:

A structured and pre-tested questionnaire and participatory techniques will be used to gather information regarding the use of medicinal plants for various diseases/ailments at home level by herbal experts, local people, old persons and interested persons. Interview will be conducted among the knowledgeable elders/informants, the traditional healers, medicine men and women or any person having traditional knowledge (usually 20-70 years of age) to collect relevant data or information. The informants will also be pursued to accompany the investigators in the field study to establish the truthfulness of the plant sample. The model of questionnaires is prepared following the methods suggested by Parabia and Reddy (2002) with slight modification.

A Model of questionnaire designed by Parabia and Reddy (2002):

Preliminary Questions:

- Respondent's Name:
- Respondent's Age :
- Education :
- Contact No. :
- Respondent's total duration of residence around study area…….years.

Plant Attributes:

- Common name (English): (to be filled in by interviewer)…….

- Scientific name: (to be filled in by interviewer)……
- Family…….
- Plant form (tick as appropriate. Filled in by interviewer from observation) :
  Tree……..Shrub……..Herb…..…….Sedge…….Grass…….
  Climber……..Other (Specify)…….
- Plant origin (tick as appropriate):
  Indigenous…….Exotic……..

Collection site:

- In relation to forest (Tick as appropriate)
- Inside……..Outside……..
- Localities Type (altitude, hill slope, valley setc.)
- GPS Position :
- Environmental Conditions :
- Block name: ……..
- District name :
- Is this plant abundantly available…….

Symptoms or condition cured (List)

1…….

2……..

3……..

4……..

Collection site description :

……

……

Part(s) used or from which medicine is extracted (tick as appropriate)

Leaves ……

Bark ……

Roots ……

Fruit ……

Flowers ……

Others (specify)……

General preparation method

……

……

Patient age group (tick as appropriate)

Elderly ……

Adults……

Youth……

Children……

Infants……

All age groups…….

Data Collection:

The study includes the gathering of both primary and secondary data. The primary data will be collected through structured unbiased questionnaire and participatory techniques. Secondary data will be collected through the information collected from the magazines, scientific journals, which are related to the subject like health care, books and articles on medicinal plants and from various journals and online resources etc.

Market Potential of medicinal plants will be analysed with reference to National Medicinal Plants Board, Ministry of Ayush, State Medicinal Plants Board, Himachal Pradesh, Shimla and Government of India, Himachal Pradesh Forest Department and other relevant sources.

Electronic Data Base or e-Herbarium:

The necessary information will be provided an online platform/electronic data base with the help of IT/ICT tools and techniques with controlled access so that the necessary information is accessed across the world any time for the welfare of humanity.

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Research Gap Identification

1. **Need to document traditional practises:** Traditional healers and their indigenous knowledge face marginalisation in mainstream healthcare systems. To address this issue, comprehensive documentation of traditional healing practises is necessary, including details about the specific plants used, drug preparation methods, dosages, and ailments they are believed to treat. However, the medicinal plants in the Shivalik Hills are at risk due to overharvesting and habitat loss caused by unsustainable exploitation.
2. **Need to create an online database:** Traditional knowledge is being inherited orally from one generation to the next and is therefore at risk of being lost over time. Creating an easily accessible and user-friendly online database would preserve this valuable traditional knowledge and promote cultural heritage and evidence-based healthcare practises.
3. **Need to explore the socio-economic potential of medicinal plants :** It can provide valuable socio-economic insights into the economic value and contributions of traditional herbal practises, including market demands, value addition opportunities, challenges in commercialization, and the utilisation and conservation of natural resources.

   Addressing these research gaps is crucial to deepening our understanding of medicinal plants in the Shivalik Hills and unlocking their potential for healthcare applications. By doing so, we can enhance our understanding of traditional herbal use by healers, validate their traditional knowledge, and promote sustainable practises.

Research gaps highlight areas where further investigation is needed to deepen our understanding and unlock hidden potential in specific areas. Based on a survey of the literature, there are very few studies on the documentation and online database of the local herbal formulations, dosages, and assessments of the socioeconomic impact of medicinal plants in Himachal Pradesh's Shivalik Hills in the Western Himalayas. There is a need for comprehensive documentation of traditional knowledge about the medicinal plants that are being used by the local healers in their traditional healing practices, including the specific plants used, their preparation methods, dosages, the ailments they are believed to treat, and their conservation. Socioeconomic study help in determining market demands, opportunities for value addition, and potential challenges in the commercialization of traditional herbal products.

Thesis Outline

Thesis will comprise of six chapters:

Chapter – 1 (Introduction):

It will include general information about the medicinal plants; traditional wisdom as a source for drugs, the role of traditional medicine in the discovery of new drugs is dealt with in this chapter. The aims and objectives of the present study were given in detail and research gaps that originated the need for the present study.

Chapter – 2 (Literature Review):

It will include the deep review of the literature concerning old and latest findings in the world, India and Himalayas with particular reference to study area..

Chapter – 3 (Materials & Methods):

It will deal with methodology of collection, field studies, morphological investigations, identification of plants. It also includes It also includes ways means of use of traditional knowledge by the healers and highlight marketing potential of studied plants.

Chapter – 4 (Result and Discussion):

In this chapter all the plants under study will be described in detail. Data will be statistically analysed. There will be photographs of the plants. It will also include the results of analysis of studies.

Chapter – 5 (Conclusion and Summary):

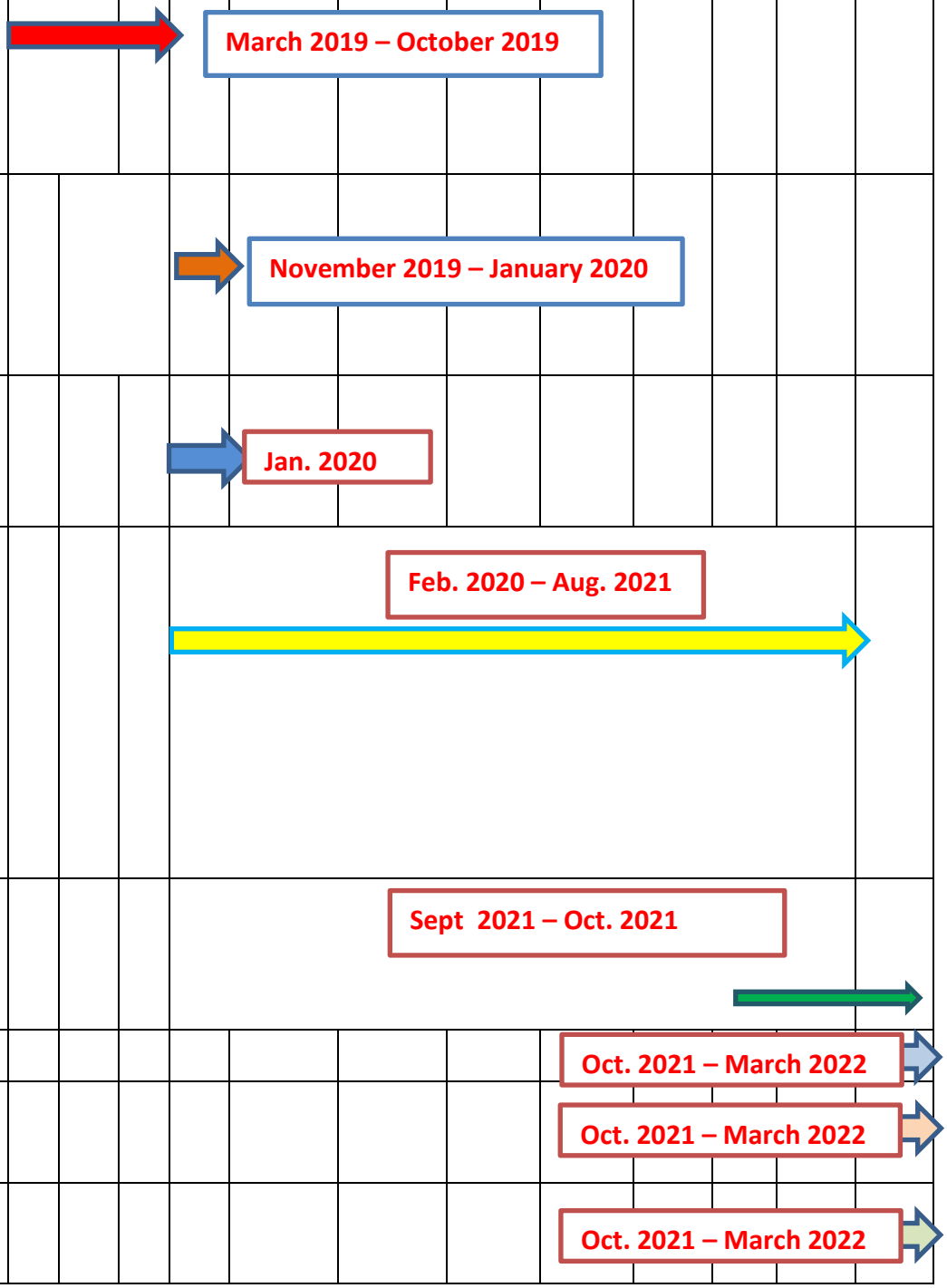
This chapter will comprise the conclusion of whole study based on objectives along with summary. The scope of further research will also be discussed.

Chapter – 6 (References):

The pattern of citing references will be according to guidelines of APA 7th Edition format citation method.

Research Plan Schedule for Ph.D

Research Activity	**Progress in Months**											
	3	6	9	12	15	18	21	24	27	30	33	36
Extensive literature survey and design of research work												
Research Gap Identification & design of methodology												
Submission of synopsis for proposed research												
1. Field Survey & Data Collection from local inhabitants. 2. Identification of Plants.												
Preparation of Online Data Base												
Thesis Writing												
Pre Thesis Presentation												
Submission of Ph.D Thesis												


March 2019 – October 2019
November 2019 – January 2020
Jan. 2020
Feb. 2020 – Aug. 2021
Sept 2021 – Oct. 2021
Oct. 2021 – March 2022
Oct. 2021 – March 2022
Oct. 2021 – March 2022

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